

SCIENTIFIC NOTE

Parasitoids of *Leptoglossus occidentalis* Heidemann (Heteroptera: Coreidae) in British Columbia

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ABSTRACT— Eggs of the western conifer seed bug, *Leptoglossus occidentalis* Heidemann, were parasitized in the field in British Columbia, Canada, by *Gryon pennsylvanicum* (Ashmead), *Anastatus pearsalli* Ashmead and an unidentified *Ooencyrtus* spp. Ashmead. *Leptoglossus occidentalis* represents a new host record for all three parasitoids. *Gryon pennsylvanicum* has not previously been reported in Canada.

The western conifer seed bug, *Leptoglossus occidentalis* Heidemann, feeds on several species of conifers (Hedlin *et al.* 1981), and can cause substantial yield losses in high-value seed orchards (Bates *et al.*, 2002; Strong *et al.* 2001). The generalist egg parasitoid, *Anastatus bifasciatus* (Geoffroy) (Hymenoptera: Eupelmidae), has recently been recovered from *L. occidentalis* egg masses in Italy (Camponogara *et al.* 2003) but little else is known about egg parasitoids of *L. occidentalis*.

Members of the family Scelionidae are egg parasitoids of several economically-important hemipteran pests (Masner 1983). *Gryon pennsylvanicum* (Ashmead) is a polyphagous, solitary parasitoid of coreids, including *Anasa tristis* (De Geer) and several *Leptoglossus* species other than *occidentalis* (Masner 1983; Mitchell 1983; Yasuda 1990; Daane *et al.* 2001). *Anastatus pearsalli* Ashmead (Hymenoptera: Eupelmidae) is widely distributed throughout the nearctic, and parasitizes hosts from several orders and families including Coreidae (Burks 1979). Members of the genus *Ooencyrtus* (Hymenoptera: Encyrtidae) are also common egg parasitoids of a number of orders and families (Gordh 1979). We report on the occurrence of *G. pennsylvanicum*, *A. pearsalli* and *Ooencyrtus* sp. in B.C. in a previously undocu-

mented host, *L. occidentalis*.

Leptoglossus occidentalis eggs were obtained by caging adult females on cone-bearing branches of lodgepole pine, *Pinus contorta* var. *latifolia* Engelmann, at Kalamalka Seed Orchard, Vernon, B.C. (50.27 °N, 119.28 °W). In 2001, females were collected from orchard trees, and in 2002 they were obtained from an outdoor colony of overwintered insects maintained at Simon Fraser University. Eggs were laid in a single row along needles, and were collected by removing the entire needle. Ten egg masses, each bearing 10-13 eggs, were transferred to separate trees throughout the orchard on 5 July in 2001. In 2002, 24 egg masses were set out on trees on 30 June. Wire paper clips were used to fasten egg-bearing needles to foliage. Eggs were 0-7 d old at the time of transfer. After three weeks, all unhatched eggs were transferred to Petri dishes, maintained at room temperature in the laboratory and monitored for parasitoid emergence. Voucher parasitoid specimens were deposited in Canadian National Collection of Insects, Agriculture and Agri-Food Canada, Ottawa, Ontario.

In 2001, 32.7% of eggs were parasitized by an unidentified scelionid(s), prompting a more systematic study in the following year. In 2002, parasitoids

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emerged from ca. 29% of *L. occidentalis* eggs. *Gryon pennsylvanicum* was the predominant parasitoid, attacking 87% of parasitized eggs. The remaining parasitized eggs were parasitized by *Anastatus pearsalli* (8%) and an unidentified *Ooencyrtus* sp. (Hymenoptera: Encyrtidae) (4%). One parasitoid failed to complete its development and was not identified. *Leptoglossus occidentalis* has not previously been recorded as a host for any of these parasitoids.

Natural rates of parasitism of *L. occidentalis* eggs may vary at other times during the season. In addition, the use of eggs that were up to 7 d old may have affected the level of parasitism, because older eggs would have been acceptable to parasitoids for a shorter period of time. However, the relatively high level of parasitism observed in this study suggests that biological control with egg parasitoids could serve as a potential component of an integrated pest management program for *L. occidentalis* in

B.C. seed orchards. Further study will be necessary to identify the full parasitic guild of this insect, its temporal synchronicity with *L. occidentalis*, and the density of wasps required to reduce seed bug populations. *Anastatus bifasciatus*, which was introduced into the eastern U.S. to control gypsy moth in the early 1900's (Crossman, 1925), may form part of the natural enemy complex of *L. occidentalis* in at least some regions of North America.

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REFERENCES

- Bates, S.L., C.G. Lait, J.H. Borden and A.R. Kermode. 2002. Measuring the impact of *Leptoglossus occidentalis* (Hemiptera: Coreidae) on seed production in lodgepole pine using an antibody-based assay. *Journal of Economic Entomology* 95: 770-777.
- Burks, B.D. 1979. Family Eupelmidae. p. 878-889. In: K.V. Krombein, P.D. Hurd, Jr., D.R. Smith, B.D. Burks (Eds.) *Catalog of Hymenoptera in America North of Mexico Vol. I*, Smithsonian Institution Press, Washington, D.C.
- Camponogara, P., M. Festi, and A. Battisti. 2003. La cimice dei semi americana: unospite indesiderato delle conifere. *Vita in Campagna* 2003: 7-8.
- Crossman, S.S. 1925. Two imported egg parasites of the gypsy moth *Anastatus bifasciatus* Fonsc. and *Schedius kuwanae* Howard. *Journal of Agricultural Research* 30: 643-675.
- Daane, K.M., G.Y. Yokota, K. Weir and S.A. Steffan. 2001. Biological investigations of hemipteran pests to improve control and reduce the spread of the fungus *Botryosphaeria dothidea*. Annual Report, Crop Year 2000-2001, California Pistachio Industry, Fresno, CA, p. 1-7.
- Gordh, G. 1979. Encyrtidae, p. 890-967. In: K.V. Krombein, P.D. Hurd, Jr., D.R. Smith, B.D. Burks (Eds.) *Catalog of Hymenoptera in America North of Mexico Vol. I*, Smithsonian Institution Press, Washington, D.C.
- Hedlin, A.F., H.O. Yates, D.C. Tovar, B.H. Ebel, T.W. Koerber and E.P. Merkel. 1981. Cone and Seed Insects of North American Conifers. Canadian Forestry Service, USDA Forest Service and Secretaria de Agricultura y Recursos Hidraulicos, Mexico, 122 p.
- Masner, L. 1983. A revision of *Gryon* Haliday in North America (Hymenoptera: Proctotrupoidea: Scelionidae). *The Canadian Entomologist* 115: 123-174.
- Mitchell, P.L. 1983. Range extensions of *Leptoglossus fulvicornis* with observations on egg parasitism. *Southwestern Entomologist* 8: 150-153.
- Strong, W.B., S.L. Bates and M.U. Stoehr. 2001. Feeding by *Leptoglossus occidentalis* Heidemann (Hemiptera: Coreidae) reduces seed set in lodgepole pine. *The Canadian Entomologist* 133: 857-865.
- Yasuda, K. 1990. Ecology of the leaf footed plant bug, *Leptoglossus australis* Fabricius (Heteroptera: Coreidae), in the sub-tropical region of Japan. *Tropical Agricultural Research Series* 23: 229-238.